

# ODONTOGENIC TUMORS

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## CANCER

Cancer is a large group of diseases that can start in almost any organ or tissue of the body when abnormal cells grow uncontrollably, go beyond their usual boundaries to invade adjoining parts of the body and/or spread to other organs. A neoplasm and malignant tumor are other common names for cancer. WHO

## NEOPLASM- Classification

Benign

- Lipoma
- Fibroma
- Hemangioma
- Adenoma
- Pre-Cancerous or Pre-Malignant
- Hyperplasia
- Atypia
- Metaplasia
- Dysplasia
- Malignant

## ONCOLOGY

A branch of medicine that specializes in the diagnosis and treatment of cancer. It includes medical oncology (the use of chemotherapy, hormone therapy, and other drugs to treat cancer), radiation oncology (the use of radiation therapy to treat cancer), and surgical oncology (the use of surgery and other procedures to treat cancer). -National Cancer Institute

## ODONTOGENIC TUMORS

### Epithelial Tumors

### Mesenchymal Tumors

### Mixed Tumors

## ODONTOGENIC TUMORS

- Derived from the epithelial and/or mesenchymal remnants of the tooth-forming apparatus.
- The origin and pathogenesis of this group of tumors are unknown.
- Are typically asymptomatic, although they may cause jaw expansion, movement of teeth, root resorption, and bone loss

### Classification of Odontogenic Tumors

#### Benign, No Recurrence Potential

Adenomatoid odontogenic tumor  
Squamous odontogenic tumor  
Cementoblastoma  
Periapical cemento-osseous dysplasia  
Odontoma

#### Benign, Some Recurrence Potential

Cystic ameloblastoma  
Calcifying epithelial odontogenic tumor  
Central odontogenic fibroma  
Florid cemento-osseous dysplasia  
Ameloblastic fibroma and fibro-odontoma

#### Benign Aggressive

Ameloblastoma  
Clear cell odontogenic tumor  
Odontogenic ghost cell tumor  
Odontogenic myxoma  
Odontoameloblastoma

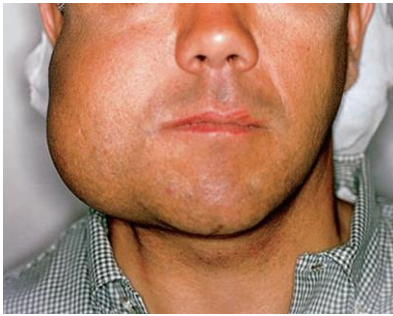
#### Malignant

Malignant ameloblastoma  
Ameloblastic carcinoma  
Primary intraosseous carcinoma  
Odontogenic ghost cell carcinoma  
Ameloblastic fibrosarcoma

## EPITHELIAL TUMORS

- Originates within the mandible or maxilla from epithelium involved in the formation of teeth.
- Within the gingiva of tooth-bearing areas
- Potential epithelial sources: the enamel organ, odontogenic rests (rests of Malassez, rests of Serres), reduced enamel epithelium, and the epithelial lining of odontogenic cysts

- Stimulus: unknown



## Ameloblastoma- Clinical Features

### • BOX 11-3 Ameloblastoma: Clinical Features

Benign, aggressive tumor that is invasive and persistent  
 Sometimes called solid or multicystic ameloblastoma  
 Adults most commonly affected  
 Broad age range; mean age, 40 years  
 Mandibular molar-ramus most commonly affected site  
 Always radiolucent  
 Unilocular or multilocular  
 Slow-growing and typically well defined radiographically  
 Treated by surgical excision to resection  
 Recurrence rate higher with conservative treatment

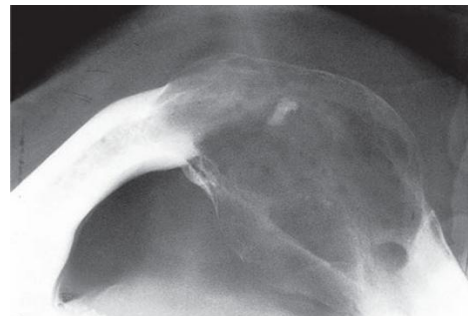
## Ameloblastoma- Radiographic Features

- **Osteolytic, typically found in the tooth-bearing areas of the jaws**
- **May be unicystic or multicystic**
- **Radiographic margins usually are well defined and sclerotic**
- **Desmoplastic ameloblastoma-ill-defined radiographic margins, anterior jaws, may resemble a fibro-osseous lesion (radiographically)**



## Ameloblastoma- Biological Subtypes

- **Peripheral or Extrasosseous Ameloblastomas**
- **Gingiva, buccal mucosa**
- **Older adults, usually between 40 and 60 years of age**
- **May arise from overlying epithelium or rests of Serres**
- **Benign, nonaggressive course**
- **Does not invade underlying bone**
- **Recurrence: rare (local excision)**



- *Peripheral or Extrasosseous Ameloblastomas*

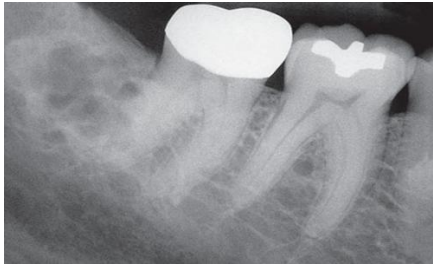
### • BOX 11-5 Peripheral Ameloblastoma

Ameloblastoma developing in gingival soft tissue  
 May originate from gingival epithelium  
 Typically does not invade underlying bone  
 Older adults most commonly affected  
 Presents as a painless gingival mass  
 Mandibular gingiva > maxillary gingival  
 Treated with local excision; rarely recurs

>, More frequently affected than.

### *Cystic Ameloblastoma (Unicystic Ameloblastoma)*

- 6% of ameloblastomas
- Multilocular, show cortical perforation
- Recurrence rate: 40% (when treated by curettage)
- Younger age group (mean age: 35 years)



• *Cystic Ameloblastoma (Unicyclic Ameloblastoma)*

• **BOX 11-6 Cystic (Unicyclic) Ameloblastoma**

**Clinical Features**

Multilocularity and cortical perforation (25% of cases)

**Histopathology**

Thin, nonkeratinized epithelium  
Basal palisading  
Spongiosis  
Epithelial invaginations  
Subepithelial hyalinization

**Microscopic Patterns**

Simple cystic intraluminal growth  
Simple cystic with mural invasion

**Treatment**

Excision  
Curettage; recurrence rate as high as 40% (seen as late as 9 years after surgery)

*Malignant variants of Ameloblastomas*

- Relatively young age group (thirties)
- Mandible > Maxilla
- Lesions that metastasize to local lymph nodes or distant organs
- Malignant lesions have been divided into two subtypes: Malignant

Ameloblastoma and Ameloblastic Carcinoma

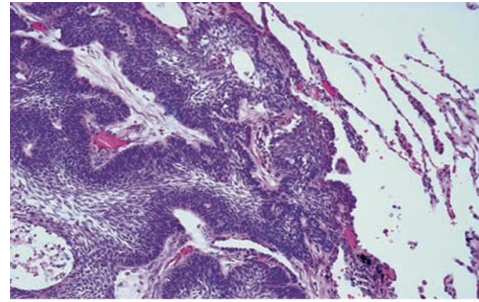
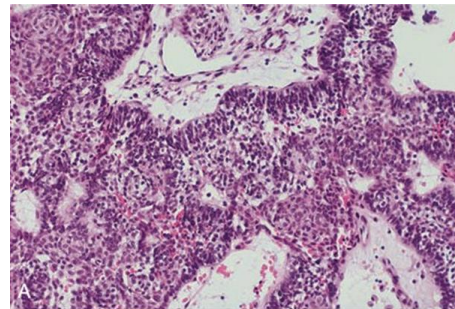


Figure 11-13 Malignant ameloblastoma in the lung



• Figure 11-14 A, Ameloblastic carcinoma

*Sinonasal Ameloblastoma*

- Mostly in men
- Mean age of 61
- Signs of nasal obstruction, epistaxis, and opacification
- “Totipotential” sinonasal lining cells are the putative cells of origin.
- Plexiform microscopic pattern

Ameloblastoma- Differential Diagnosis

- Odontogenic tumors
  - Calcifying epithelial odontogenic tumor
  - Odontogenic myxomas
- Cysts
  - Dentigerous cyst
  - Odontogenic keratocyst
- Benign non-odontogenic lesions
  - Central giant cell granuloma

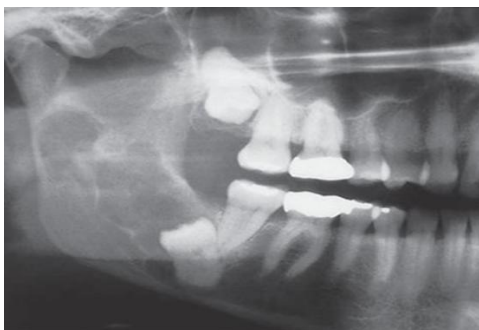
- Ossifying fibroma
- Central hemangioma
- Idiopathic histiocytosis

#### Ameloblastoma- Treatment and Prognosis

- No single standard type of therapy can be advocated for patients with ameloblastoma.
  - Solid Ameloblastomas: Surgical excision to block excision or resection followed by immediate surgical reconstruction
  - Cystic Ameloblastomas: Enucleation to resection
  - Peripheral Ameloblastomas : more conservative treatment
  - Malignant lesions should be managed as carcinomas
- Ameloblastomas of the maxilla generally are more difficult to manage than those of the mandible
- Radiotherapy has rarely been used

### Calcifying Epithelial Odontogenic Tumor (Pindborg Tumor)

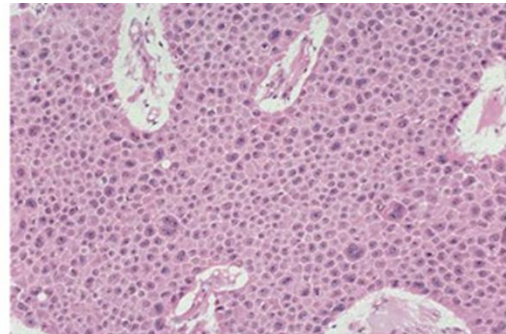
- The cells from which these tumors are derived are unknown, although dental lamina remnants and the stratum intermedium of the enamel organ have been suggested.



#### Calcifying Epithelial Odontogenic Tumor (Pindborg Tumor)- Clinical Features

- Second to the tenth decade, with a mean age of about 40 years.
- No gender predilection
- Mandible > Maxilla (Molar-ramus region)
- Jaw expansion or incidental observation on a routine radiographic survey
- Often associated with impacted teeth.
- Honeycomb pattern

#### Calcifying Epithelial Odontogenic Tumor (Pindborg Tumor)- Histopathology



• **Figure 11-22** Calcifying epithelial odontogenic tumor composed of a sheet of atypical and multinucleated tumor epithelial cells.

#### Calcifying Epithelial Odontogenic Tumor (Pindborg Tumor)-Differential Diagnosis

- Dentigerous cyst
- Odontogenic keratocyst
- Ameloblastoma
- Odontogenic myxoma
- Some benign non-odontogenic jaw tumors
- Calcified odontogenic cyst
- Adenomatoid odontogenic tumor
- Ameloblastic fibro-odontoma
- Ossifying fibroma
- Osteoblastoma

## Calcifying Epithelial Odontogenic Tumor (Pindborg Tumor)- Treatment

- Enucleation
- Resection
- Recurrence Rate: less than 20%
- Metastases have not been reported

## Adenomatoid Odontogenic Tumor

- Formerly termed adenoameloblastoma
- Between 5 and 30 years, with most cases appearing in the second decade.
- Females > Males
- Anterior portion of the jaws, more often in the anterior maxilla, generally in association with the crowns of impacted teeth
- Three variants:
  - Follicular (73% of cases)
  - Extrafollicular (24%)
  - Peripheral (3%)

### Adenomatoid Odontogenic Tumor Radiographic Features

- Well-circumscribed unilocular lesion that usually appears around the crown of an impacted tooth (Follicular AOT)
- Well-defined unilocular radiolucency above, between, or superimposed over the roots of an unerupted tooth (Extrafollicular AOT)
- May have small opaque foci distributed throughout

### • BOX 11-10 Odontogenic Lesions that may have Opaque FOCI

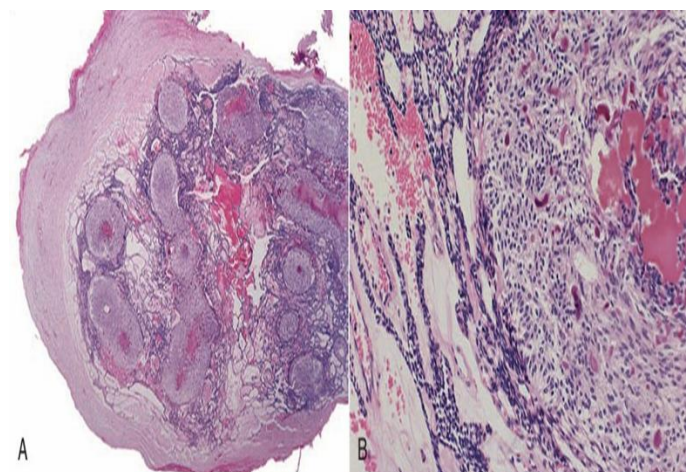
Calcifying epithelial odontogenic tumor  
 Adenomatoid odontogenic tumor  
 Dentinogenic ghost cell tumor (calcifying odontogenic tumor)  
 Cementifying fibroma  
 Periapical cemento-osseous dysplasia  
 Ameloblastic fibro-odontoma  
 Odontoma

- When they are located between anterior teeth, divergence of roots may be seen.



### Adenomatoid Odontogenic Tumor Histopathology

- Rosettes and ductlike structures of columnar epithelial cells



• **Figure 11-28** Adenomatoid odontogenic tumor. **A** and **B**, Characteristic thick capsule and intraluminal nodular proliferation. Note calcified material in **B** (right).

### Adenomatoid Odontogenic Tumor- Differential Diagnosis

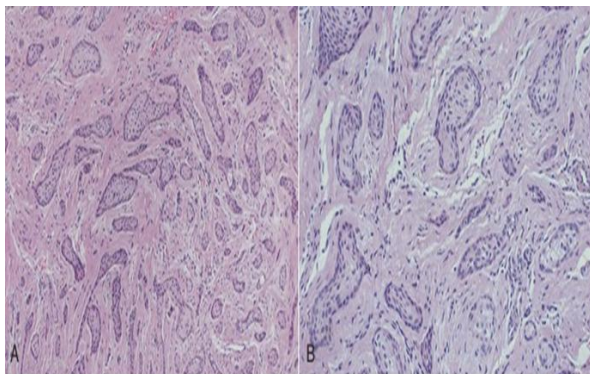
- Dentigerous cyst
- Lateral periodontal cyst
- Calcifying odontogenic cyst
- CEOT

### Adenomatoid Odontogenic Tumor- Treatment

- Conservative treatment (enucleation)
- Does not recur

## Squamous Odontogenic Tumor

- Derived from neoplastic transformation of the rests of Malassez
- Mandible = Maxilla
- Age range: second through seventh decades, mean age: 40 years
- No gender predilection
- Tenderness and tooth mobility
- Radiographically: well circumscribed, often semilunar lesion associated with the cervical region of roots of teeth.
- Treatment of choice: Curettage or excision

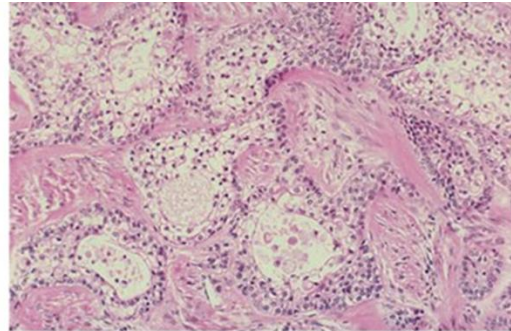


• Figure 11-30 Squamous odontogenic tumor. A and B, Bland proliferation of squamous islands.

### Clear Cell Odontogenic Tumor (Carcinoma)

- A rare neoplasm of the mandible and maxilla
- Found in women older than 60 years

- Locally aggressive, poorly circumscribed neoplasm composed of sheets of cells with relatively clear cytoplasm
- Rate of recurrence: 50%
- Metastases: to lung and regional LNs



• Figure 11-31 Clear cell odontogenic tumor as nests of odontogenic epithelium with relatively clear cytoplasm.

### Clear Cell Odontogenic Tumor (Carcinoma)- Differential Diagnosis

- CEOT
- Central mucoepidermoid carcinoma
- Metastatic acinic cell carcinoma
- Metastatic renal cell carcinoma
- Hyalinizing clear cell carcinoma
- Ameloblastoma

### Clear Cell Odontogenic Tumor (Carcinoma)

#### • BOX 11-11 Clear Cell Odontogenic Tumor

##### Histogenesis

Unknown; probably odontogenic

##### Clinical Features

Age over 60 years; women affected more often than men  
Either jaw  
Occasionally painful

##### Histopathology

Nests/cords of clear cells, some palisades  
Some glycogen; mucin negative

##### Microscopic Differential Diagnosis

Calcifying epithelial odontogenic tumor  
Mucoepidermoid carcinoma  
Renal cell carcinoma

##### Behavior

Recurrence and metastasis (neck nodes/lung)

## Keratocystic Odontogenic Tumor/ Odontogenic Keratocyst

In the recent World Health Organization classification of tumours of the head and neck, the name keratocystic odontogenic tumour (KCOT) has been changed again to odontogenic keratocyst (OKC). This decision has caused some confusion and has undoubtedly lessened alertness regarding this potentially very aggressive lesion

- A pathologic space filled with fluid or semisolid material lined by epithelium.
- Indications that the OKC may be a cystic neoplasm
- recurrence rate
- overexpression of cell cycle proteins
- an association with a proliferation-related genetic mutation

### *Keratocystic Odontogenic Tumor/ Odontogenic Keratocyst- Etiology and Pathogenesis*

- Develop from dental lamina remnants in the mandible and maxilla.
- Factors that may contribute to the pathogenesis of the OKC/KCOT:
  - High proliferation rate
  - Overexpression of the antiapoptotic protein Bcl-2
  - Several growth factors, and expression of MMPs 2 and 9

### *Keratocystic Odontogenic Tumor/ Odontogenic Keratocyst- Clinical Features*

#### • BOX 10-6 Odontogenic Keratocyst: Clinical Features

Aggressive; recurrence risk; association with nevoid basal cell carcinoma syndrome  
Solitary cysts: common (5%-15% of odontogenic cysts); recurrence rate 10% to 30%  
Multiple cysts: 5% of OKC patients; recurrence greater than with solitary cysts  
Syndrome-associated, multiple cysts: 5% of OKC patients; recurrence greater than with multiple cysts

OKC, Odontogenic keratocyst.

### *Keratocystic Odontogenic Tumor/ Odontogenic Keratocyst- Radiographic Features*

- Well-circumscribed radiolucency with smooth radiopaque margins
- Unilocular or Multilocular
- Buccal expansion
- Mandibular lingual enlargement

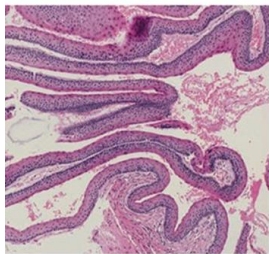


### *Keratocystic Odontogenic Tumor/ Odontogenic Keratocyst- Histopathology*

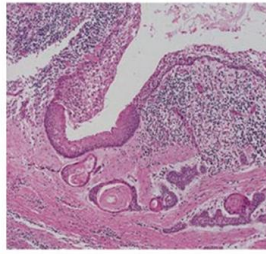
• **BOX 10-7** **Odontogenic Keratocyst: Diagnosis**

- Thin epithelium (6-10 cell layers)
- Refractile, parakeratotic lining
- Epithelial budding and “daughter cysts”
- Characteristic microscopic features lost when inflamed
- Orthokeratinized odontogenic cyst
  - Lined by thin orthokeratinized epithelium
  - Less common
  - Not syndrome associated
  - Lower recurrence rate

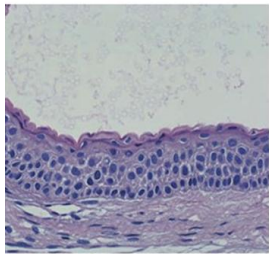
*Keratocystic Odontogenic Tumor/  
Odontogenic Keratocyst-  
Histopathology*



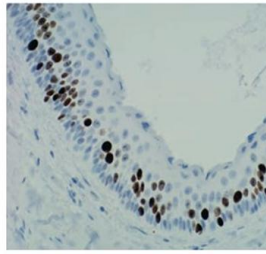
Odontogenic keratocyst epithelium exhibiting characteristic adherence to underlying connective tissue.



• **Figure 10-31** Odontogenic keratocyst showing features in areas of inflammation, as well as mural daughter cysts.



Odontogenic keratocyst showing characteristic basal cell polarization.



• **Figure 10-32** Odontogenic keratocyst. Note staining nuclei (brown) in immunohistochemical staining for protein Ki-67.

*Keratocystic Odontogenic Tumor/  
Odontogenic Keratocyst-  
Differential  
Diagnosis*

- Dentigerous cyst
- Ameloblastoma
- Odontogenic myxoma
- Adenomatoid odontogenic tumor
- Ameloblastic fibroma
- Central giant cell granuloma

- Traumatic bone cyst
- Aneurysmal bone cyst

*Keratocystic Odontogenic Tumor/  
Odontogenic Keratocyst-  
Treatment and  
Prognosis*

- Surgical excision with peripheral osseous curettage or ostectomy
- Surgical decompression and marsupialization
- Recurrence rate: from 10% to 30%
- Most recurrences become clinically evident within 5 years of treatment.

**Dentinogenic Ghost Cell Tumor  
(Formerly Calcifying  
Odontogenic Cyst)**

- Are developmental odontogenic lesions that occasionally exhibit recurrence
- A solid variant known as odontogenic ghost cell tumor is believed to potentially exhibit more aggressive clinical behavior.

• **BOX 10-9** **Calcifying Odontogenic Cyst  
(Calcifying Cystic Odontogenic  
Tumor)**

**Clinical Features**

No distinctive age, gender, or location  
Lucent to mixed radiographic patterns

**Histopathology**

Basal palisading  
Ghost cells and dystrophic calcification  
Similar to pilomatrixoma of skin

**Behavior**

Unpredictable

**Variants**

Odontogenic ghost cell tumor—solid  
Odontogenic ghost cell carcinoma—cytologic atypia, mitoses, pleomorphism, necrosis

*Dentinogenic Ghost Cell Tumor  
(Formerly Calcifying Odontogenic Cyst)-  
Etiology and Pathogenesis*

- Derived from odontogenic epithelial remnants within the gingiva or within the mandible or maxilla.
- Characteristic microscopic feature: Ghost cell keratinization

- Calcifying epithelioma of Malherbe, or pilomatrixoma

***Dentinogenic Ghost Cell Tumor  
(Formerly Calcifying Odontogenic Cyst)-  
Clinical Features***

- Wide age range, with a peak incidence in the second decade
- Predilection for females
- More than 70% of COCs are seen in the maxilla
- May present as localized extraosseous masses involving the gingiva

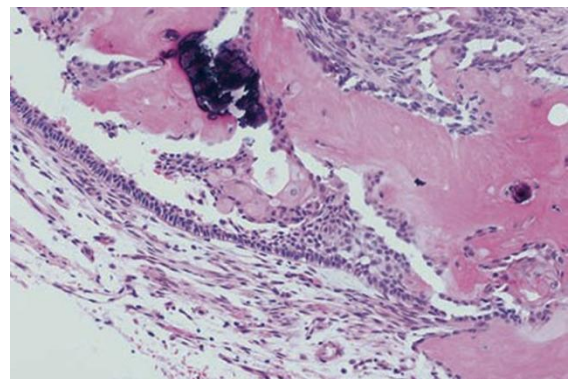
***Dentinogenic Ghost Cell Tumor  
(Formerly Calcifying Odontogenic Cyst)-  
Radiographic Features***

- Unilocular or multilocular radiolucencies
- Discrete, well-demarcated margins
- Scattered, irregularly sized calcifications- salt-and-pepper pattern



***Dentinogenic Ghost Cell Tumor  
(Formerly Calcifying Odontogenic Cyst)-  
Histopathology***

- Well-delineated cystic proliferations with a fibrous connective tissue wall lined by odontogenic epithelium
- Epithelial lining is of variable thickness
- The basal epithelium may be prominent focally, with hyperchromatic nuclei and a cuboidal to columnar pattern.
- Ghost cell keratinization



***Dentinogenic Ghost Cell Tumor  
(Formerly Calcifying Odontogenic Cyst)-  
Differential Diagnosis***

- Dentigerous cyst
- OKC/KCOT
- Ameloblastoma
- Adenomatoid odontogenic tumor
- A partially mineralized odontoma
- Calcifying epithelial odontogenic tumor
- Ameloblastic fibro-odontoma

***Dentinogenic Ghost Cell Tumor  
(Formerly Calcifying Odontogenic Cyst)-  
Treatment and Prognosis***

- Treatment is usually more aggressive than simple curettage
- Recurrences are not uncommon

- Management of the extraosseous or peripheral variant is conservative because recurrence is not characteristic.

## MESENCHYMAL TUMORS

*Odontogenic Myxoma*

*Central Odontogenic Fibroma*

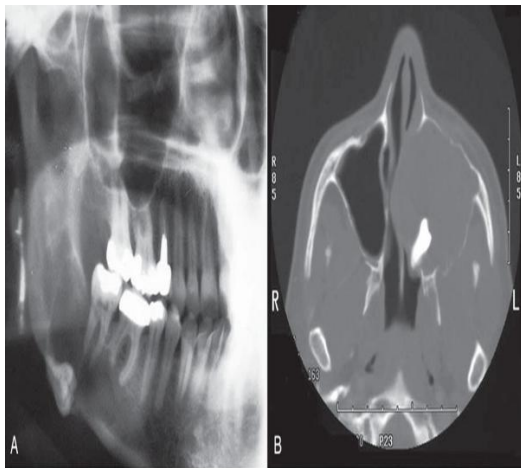
*Cementifying Fibroma*

*Cementoblastoma*

*Periapical Cementoosseous Dysplasia*

### Odontogenic Myxoma

- A benign mesenchymal lesion that mimics microscopically the dental pulp or follicular connective tissue
- 1% to 17%
- Only odontogenic myxoma of the jaws is derived from odontogenic ectomesenchyme



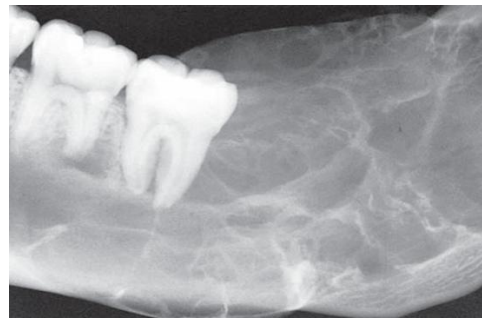
• **Figure 11-32 A**, Odontogenic myxoma of the right mandible. Note malpositioned third molar.  
**B**, Odontogenic myxoma of the maxilla with a widely expansile quality containing an impacted tooth.

### Odontogenic Myxoma- Clinical Features

- 10 to 50 years, with a mean of about 30 years
- No gender predilection
- Mandible = Maxilla

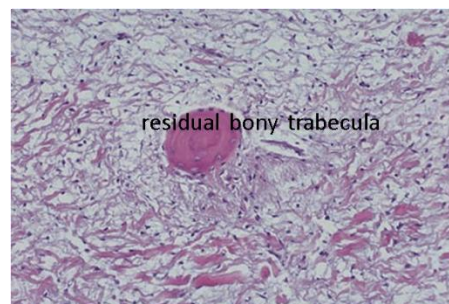
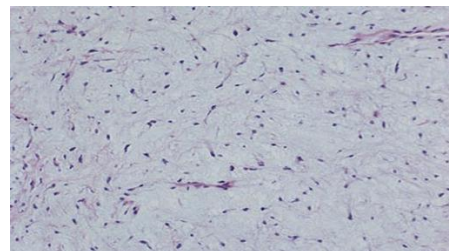
### Odontogenic Myxoma- Radiographic Features

- Always lucent, although the pattern may be quite variable
- Well-circumscribed or diffuse lesion
- Often is multilocular with a honeycomb pattern
- Other radiographic patterns and descriptors: “honeycomb,” “soap bubble”, or “tennis racket”
- Cortical expansion or perforation and root displacement or resorption may be seen.



### Odontogenic Myxoma- Histopathology

- Bland, relatively acellular myxomatous connective tissue
- Bony islands, representing residual trabeculae, and capillaries are found scattered throughout the lesion
- Odontogenic rests are absent



## Odontogenic Myxoma- Differential Diagnosis

- Ameloblastoma
- Central hemangioma
- Nerve sheath myxoma

## Odontogenic Myxoma- Treatment

- Surgical excision (conservative to radical)
- Recurrence is more likely if the lesion is treated too conservatively
- Prognosis is very good
- Follow-up examinations: minimum of 5 years

### • BOX 11-12 Odontogenic Myxoma (Fibromyxoma)

#### Histogenesis

Periodontal ligament or dental pulp

#### Clinical Features

Adults (median age, about 30 years)  
Either jaw

#### Histopathology

Bland myxoid  
Rare epithelial rests  
Variable amounts of collagen

#### Microscopic Differential Diagnosis

Hyperplastic follicular sac and dental pulp  
Odontogenic fibroma  
Desmoplastic fibroma

#### Behavior

Recurrences  
No capsule and loose tumor consistency

## Central Odontogenic Fibroma

- Regarded as the central counterpart to peripheral odontogenic fibroma
- Seen in all age groups
- Mandible = Maxilla
- 2:1 female predilection

### • BOX 11-13 Central Odontogenic Fibroma

#### Histogenesis

Origin unknown; may be from periodontal ligament or dental pulp

#### Clinical Features

Adults  
Well-defined lucency

#### Histopathology

Collagenous with epithelial strands

#### Microscopic Differential Diagnosis

Desmoplastic fibroma  
Fibromyxoma  
Hyperplastic follicular sac

#### Behavior

Few recurrences

## Central Odontogenic Fibroma- Radiographic Features

- Radiolucent lesion that usually is multilocular, often causing cortical expansion
- 45% of cases occur anterior to the first molar region of the maxilla, often with a cortical bony depression of the palatal contour.



## Cementoblastoma

- True cementoma
- A rare benign neoplasm of cementoblasts that microscopically resembles an osteoblastoma but is connected or fused to the root of a tooth
- Second and third decades of life, typically before 25 years of age.
- No gender predilection
- Mandible > Maxilla
- Posterior > Anterior

- Associated with the root of a tooth, and the tooth remains vital.
- May cause cortical expansion and, occasionally, lowgrade intermittent pain

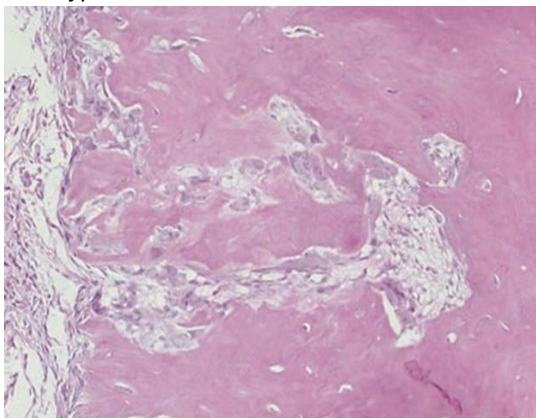
### *Cementoblastoma- Radiographic Features*

- Opaque lesion that replaces the root of the tooth
- Surrounded by a thick uniform radiolucent ring that is contiguous with the periodontal ligament space and the advancing front of the tumor.



### *Cementoblastoma- Histopathology*

- Dense mass of mineralized cementum-like material with numerous reversal lines
- Intervening well-vascularized soft tissue contains cementoblasts, often numerous, large, and hyperchromatic.



### *Cementoblastoma- Differential Diagnosis*

- Odontoma
- Osteoblastoma
- Focal sclerosing osteomyelitis
- Hypercementosis

### *Cementoblastoma- Treatment*

- Bone relief
- Recurrence is not seen

## • BOX 11-14 Cementoblastoma

Benign fibro-osseous/cementum jaw lesion  
 Young adults, mandible > maxilla  
 Attached to and replaces tooth root  
 Periodontal ligament space surrounds lesion  
 Opaque mass; may rarely cause cortical expansion  
 Histologic features of osteoblastoma  
 Attached to tooth; tooth removed with lesion  
 No recurrence

>, More frequently affected than.

## Periapical Cemento-osseous Dysplasia

- Appears to be an unusual response of periapical bone and cementum to some undetermined local factor
- Populations most at risk include East Asians and those of African origin.
- When not associated with a tooth apex, the term focal cemento-osseous dysplasia is used.

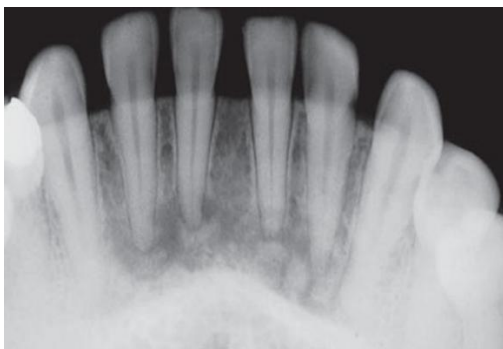
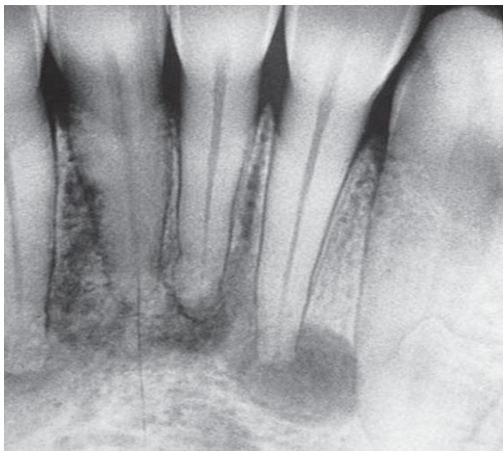
### *Periapical Cemento-osseous Dysplasia- Clinical Features*

- Occurs at the apex of vital teeth
- Women (especially black women) > Men

- Middle age (;40 years) and rarely before the age of 20.
- The mandible, especially the anterior periapical region, is far more commonly affected than other areas.
- Often, the apices of two or more teeth are affected.
- Asymptomatic

### *Periapical Cemento-osseous Dysplasia- Radiographic Features*

- Periapical lucency that is continuous with the periodontal ligament space
- Teeth are always vital
- As the condition progresses or matures, the lucent lesion develops into a mixed or mottled pattern because of bone repair.
- In its final stage, the tumor appears as a solid, opaque mass that is often surrounded by a thin, lucent ring.

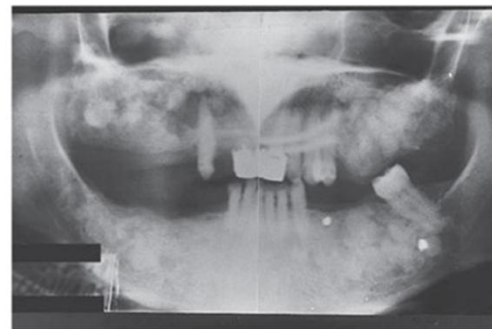


### *Florid Cemento-Osseous Dysplasia*

- No cause is apparent
- Asymptomatic, except when the complication of osteomyelitis occurs.
- Women, between 25 and 60 years of age.
- Bilateral and may affect all four quadrants.
- Concomitant appearance of traumatic (simple) bone cysts in affected tissue.
- Radiographically, FCOD appears as diffuse radiopaque masses throughout the alveolar segment of the jaws. A ground-glass or cystlike appearance may be seen.



• **Figure 11-44** Florid cemento-osseous dysplasia of the mandible.

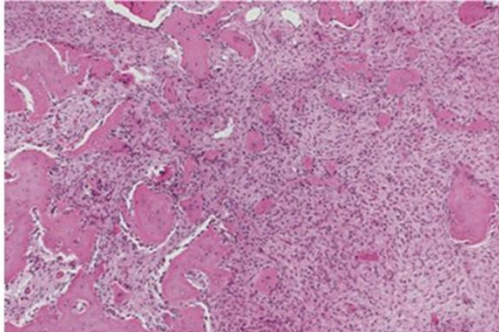


• **Figure 11-45** Florid cemento-osseous dysplasia of the mandible and maxilla. (Reproduced with permission from Regezi JA, Sciubba

### *Periapical Cemento-osseous Dysplasia- Histopathology*

- Represents a mixture of benign fibrous tissue, bone, and cementum
- Calcified tissue is arranged in trabeculae, spicules, or larger irregular masses

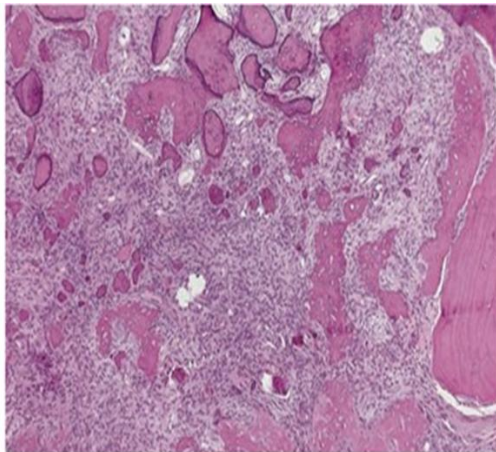
- Reversal lines eventually are seen, and osteoblasts, cementoblasts, or both, line the islands of hard tissue.
- Chronic inflammatory cells may also be seen.



• **Figure 11-46** Periapical cemento-osseous dysplasia. This lesion has a heterogeneous benign fibro-osseous appearance.

### Florid Cemento-Osseous Dysplasia Histopathology and Treatment

- Consists of a benign fibrous stroma that contains irregular trabeculae of mature and immature bone and cementumlike material
- An asymptomatic, self-limited process, no treatment is required.
- Antibiotics and sequestrectomy



• **Figure 11-47** Florid cemento-osseous dysplasia. This lesion has a heterogeneous benign fibro-osseous appearance.

### Periapical Cemento-osseous Dysplasia Differential Diagnosis

- Chronic osteomyelitis
- Ossifying fibroma

- Periapical granuloma or cyst
- In the opaque stage: odontoma, osteoblastoma, and focal sclerosing osteomyelitis are diagnostic possibilities.

### Florid Cemento-Osseous Dysplasia-Differential Diagnosis

- Diffuse sclerosing osteomyelitis
- Paget's disease
- Familial gigantiform cementoma

### Periapical Cemento-osseous Dysplasia-Treatment

- No treatment is required for periapical cemento-osseous dysplasia or FCOD.
- Once the opaque stage is reached, the lesion usually stabilizes and causes no complications.

## • BOX 11-15 Periapical Cemento-Osseous Dysplasia

### Clinical Features

Reactive, unknown stimulus, teeth vital  
 Common in anterior mandible of adults  
 No symptoms  
 Progresses from lucent to opaque lesion  
 Exuberant variant—florid cemento-osseous dysplasia

### Histopathology

Fibro-osseous lesion  
 Mature and immature bone  
 Heterogeneous pattern  
 Few inflammatory cells

### Other

No treatment  
 Clinical radiographic correlation is diagnostic

## MIXED TUMORS

- Ameloblastic Fibroma and
- Ameloblastic Fibro-odontoma
- Odontoma

## Ameloblastic Fibroma and Ameloblastic Fibro-odontoma

### • BOX 11-17 Ameloblastic Fibroma/ Fibro-odontoma

Occurs in children and teenagers

Often associated with an impacted tooth

Composed of neoplastic epithelium and neoplastic myxomatous connective tissue

Treatment by curettage or excision

Excellent prognosis; rarely recurs

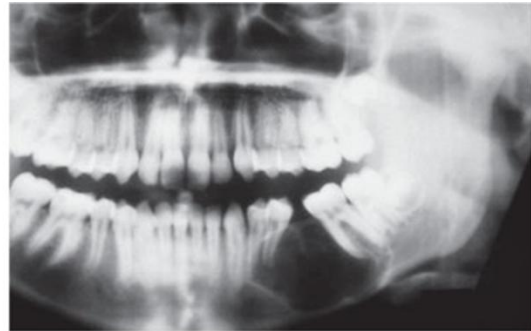
Malignant counterpart is rare

### *Ameloblastic Fibroma and Ameloblastic Fibro-odontoma- Clinical Features*

- Occur predominantly in children and young adults
- Mean age: about 12 years, and the upper age limit is around 40 years.
- The mandibular molar-ramus area is the favored location for these lesions, although they may appear in any region
- There is no gender predilection

### *Ameloblastic Fibroma and Ameloblastic Fibro-odontoma- Radiographic Features*

- Well circumscribed and usually are surrounded by a sclerotic margin
- May be unilocular or multilocular and may be associated with the crown of an impacted tooth.
- An opaque focus that appears within the ameloblastic fibroodontoma is due to the presence of an odontoma.
- Appears as a combined lucent-opaque lesion
- The ameloblastic fibroma is completely lucent radiographically



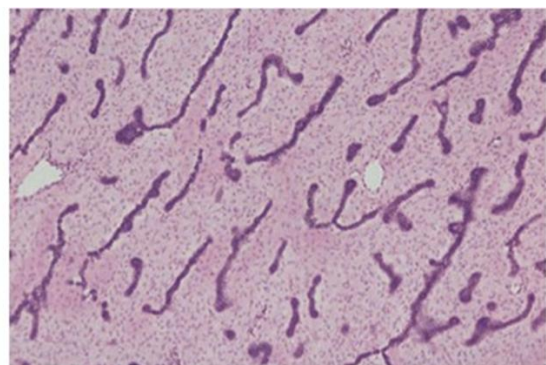
• **Figure 11-48** Ameloblastic fibroma of the left mandible. The lesion is a well-circumscribed lucency.



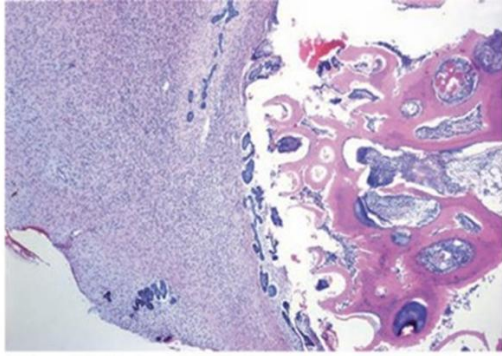
• **Figure 11-49** Ameloblastic fibro-odontoma as represented in the right molar-ramus area of this skull radiograph. Note odontoma between impacted teeth.

### *Ameloblastic Fibroma and Ameloblastic Fibro-odontoma- Histopathology*

- Lobulated in general configuration and usually are surrounded by a fibrous capsule
- Tumor mass is composed predominantly of primitive-appearing myxoid connective tissue
- Ameloblastic fibro-odontoma- one or more foci contain enamel and dentin
- May be seen in the form of a compound or complex odontoma



• **Figure 11-50** Ameloblastic fibroma composed of pale myxoid stroma with numerous strands of odontogenic epithelium.



• **Figure 11-52** Ameloblastic fibro-odontoma. Note odontoma at right.

### *Ameloblastic Fibroma and Ameloblastic Fibro-odontoma- Differential Diagnosis*

- Ameloblastic fibroma
  - Ameloblastoma
  - Odontogenic myxoma
  - Dentigerous cyst
  - Odontogenic keratocyst
  - Central giant cell granuloma
  - Histiocytosis
- Ameloblastic fibro-odontoma
  - Calcifying epithelial odontogenic tumor
  - Calcifying odontogenic cyst
  - Developing odontoma
  - AOT

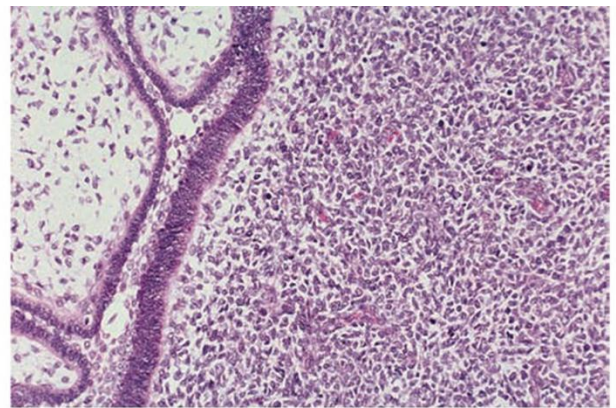
### *Ameloblastic Fibroma and Ameloblastic Fibro-odontoma- Treatment*

- Conservative surgical procedure: Curettage or Excision
- Recurrences have been documented, but they are uncommon

### *Ameloblastic Fibrosarcoma*

- A rare malignant counterpart

- Arising in the jaws de novo or from preexisting or recurrent ameloblastic fibroma
- Mesenchymal component: appearance of a fibrosarcoma
- Epithelial component: benign lesion
- Occurs at about 30 years of age
- Mandible > Maxilla
- Pain and paresthesia
- Has metastatic potential
- Treatment of choice: Resection



• **Figure 11-53** Ameloblastic fibrosarcoma with a malignant mesenchymal component.

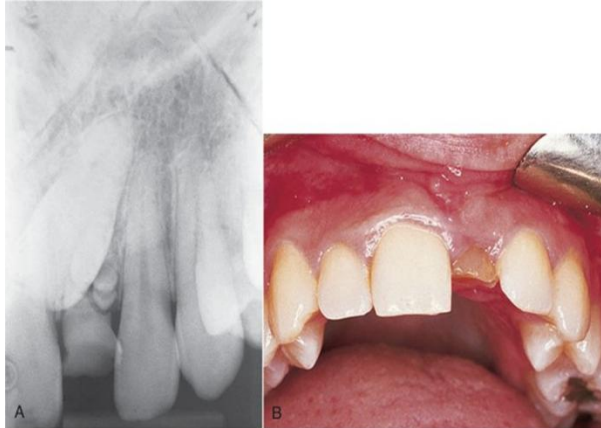
## **Odontomas**

- Can be regarded as hamartomas rather than neoplasms
- May appear as numerous miniature or rudimentary teeth, in which case they are known as compound odontomas or
- May appear as amorphous conglomerations of hard tissue, in which case they are known as complex odontomas
- The most common odontogenic tumors

### *Odontomas- Clinical Features*

- Lesions of children and young adults
- Discovered in the second decade of life to later adulthood
- Maxilla > Mandible

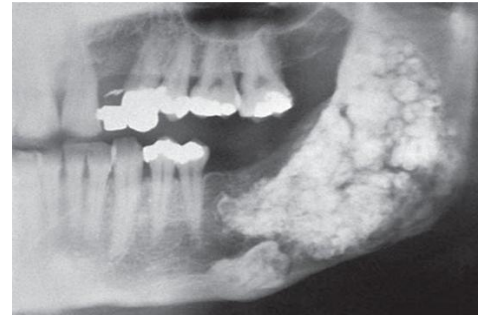
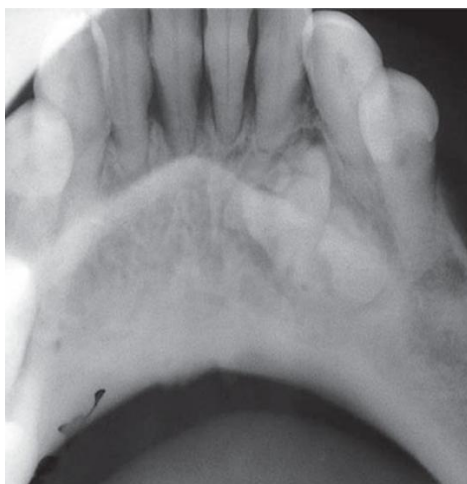
- Compound odontomas = anterior jaws
- Complex odontomas = posterior jaws
- No significant gender predilection
- Clinical signs: retained deciduous tooth, an impacted tooth, and alveolar swelling
- These lesions generally produce no symptoms



• **Figure 11-54** A, Compound odontoma blocking the eruption of a permanent tooth. B, Retained deciduous tooth overlying compound odontoma.

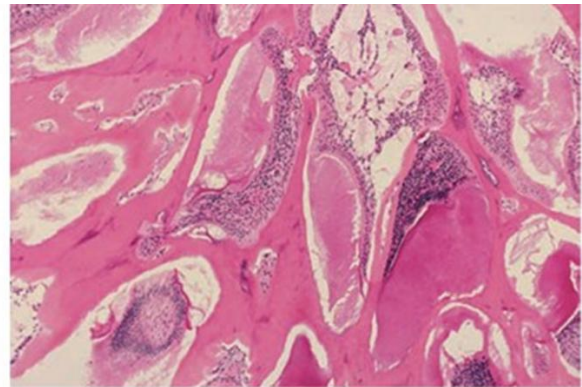
### *Odontomas- Radiographic Features*

- Compound odontomas typically appear as numerous tiny teeth in a single focus.
- Found in a tooth-bearing area, between roots or over the crown of an impacted tooth.
- Complex odontomas appear in the same regions, but as amorphous, opaque masses
- Lesions discovered during early stages of tumor development are primarily radiolucent, with focal areas of opacity representing early calcification of dentin and enamel



### *Odontomas- Histopathology*

- Normal appearing enamel, dentin, cementum, and pulp
- Prominent enamel matrix and the associated enamel organ are often seen before final maturation of hard tissues
- Ghost cell keratinization is seen occasionally in the enamel-forming cells of some odontomas



• **Figure 11-57** Complex odontoma (decalcified) showing a network of pink dentin and islands of bluish enamel matrix.

### *Odontomas- Differential Diagnosis*

- Focal sclerosing osteitis
- Osteoma
- Periapical cemental dysplasia
- Ossifying fibroma
- Cementoblastoma

### *Odontomas- Treatment*

- Enucleation is curative
- Recurrence: not a problem

• **BOX 11-18** **Odontoma**

Most common odontogenic tumor

Regarded as a hamartoma rather than a neoplasm

Children

Asymptomatic

Discovered on routine radiographic examination or  
when it blocks the eruption of a tooth

Compound type

Composed of multiple miniature teeth

Most commonly found in anterior maxilla

Complex type

Conglomerate mass of enamel and dentin

Most commonly found in the posterior jaws

Treated by enucleation; does not recur

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# **“BENIGN NON- ODONTOGENIC TUMORS”**

Lecture by : Dr PATRICIA DYAN L.  
LIGON, DMD

## **OUTLINE**

- ▶ OSSIFYING FIBROMA
- ▶ FIBROUS DYSPLASIA
- ▶ CEMENTO-OSSEOUS DYSPLASIA
- ▶ OSTEOSTOMA/ OSTEOID OSTEOMA
- ▶ OSTEOMA
- ▶ DESMOPLASMIC FIBROMA
- ▶ CHONDROMA
- ▶ CENTRAL GIANT CELL GRANULOMA
- ▶ GIANT CELL TUMOR
- ▶ HEMANGIOMA OF BONE
- ▶ LANGERHANS CELL DISEASE
- ▶ TORI AND EXOSTOSES
- ▶ CORONOID HYPERPLASIA

## **OSSIFYING FIBROMA**

- ▶ A benign neoplasm that can occur in any facial bone and has the potential for excessive growth, bone destruction, and recurrence.
- ▶ Composed of a fibrous connective tissue stroma in which new bone is formed

### • BOX 12-1 Fibro-Osseous Lesions of the Jaws

Generic microscopic term  
Benign fibrous stroma with immature bone  
Includes reactive, dysplastic, neoplastic lesions  
Histologic overlap  
Diagnosis based on clinical pathologic correlation

### • BOX 12-2 Fibro-Osseous Lesions of the Jaws: Entities Most Commonly Included

Ossifying fibroma  
Fibrous dysplasia  
Cemento-osseous dysplasia  
    Periapical/focal  
    Florid  
Chronic osteomyelitis

## *Etiology and Pathogenesis*

- ▶ Undetermined cause
- ▶ Chromosome translocations

### • BOX 12-3 Ossifying Fibroma

#### **Clinical Features**

Third and fourth decades  
Mandible > maxilla  
Well circumscribed  
Lucent or lucent/opaque pattern  
Continuous growth

#### **Histopathology**

Cellular fibrous matrix  
Islands/trabeculae of new bone  
Osteoblasts; no osteoclasts  
Relatively homogeneous pattern  
No inflammatory cells

#### **Treatment**

Curettage/excision  
>, More frequently affected than.

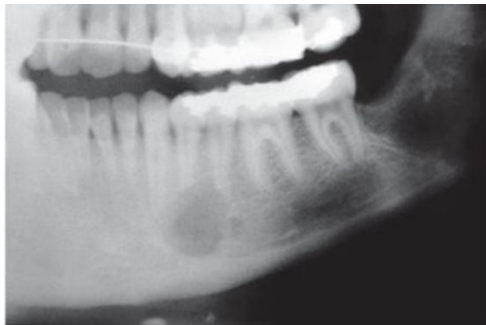
## *Clinical Features*

- ▶ Uncommon lesion that tends to occur during the third and fourth decades of life
- ▶ Women > Men
- ▶ Slowgrowing, asymptomatic, and expansile lesion
- ▶ Expansion and thinning of the buccal and lingual cortical plates
- ▶ Most of these lesions are solitary



### Radiographic Features

- ▶ Well-circumscribed, sharply defined border, with a generally expansile profile
- ▶ May be relatively radiolucent -> evenly dispersed, calcified new bone
- ▶ May also appear as unilocular or multilocular radiolucencies that bear a resemblance to odontogenic lesions.
- ▶ A mixed radiolucent-radiopaque image is seen when islands of tumor bone are densely calcified.
- ▶ Roots of teeth may be displaced; less commonly, tooth resorption is seen



• **Figure 12-1** Ossifying fibroma of the left mandible. The lesion is relatively radiolucent at apices of premolars.



• **Figure 12-2** Ossifying fibroma in the anterior mandible showing cortical expansion.

### Juvenile Ossifying Fibroma

- ▶ Juvenile trabecular ossifying fibroma (JTOF)
  - ▶ Occurs in children and adolescents
  - ▶ Occurs almost exclusively in the maxilla and mandible
  - ▶ Characterized by progressive and sometimes rapid growth but rarely pain
  - ▶ Radiographically: defined border; radiodense to radiolucent
  - ▶ Microscopically: highly cellular; trabeculae or spheroids of new bone
  - ▶ Recurrence: rare
- ▶ Juvenile psammomatoid ossifying fibroma (JPOF)
  - ▶ Occurs principally in the extragnathic craniofacial bones: paranasal sinuses and periorbital bones
  - ▶ Occurs in a slightly older population

#### • BOX 12-4 Ossifying Fibroma Variants

##### Juvenile Trabecular Ossifying Fibroma

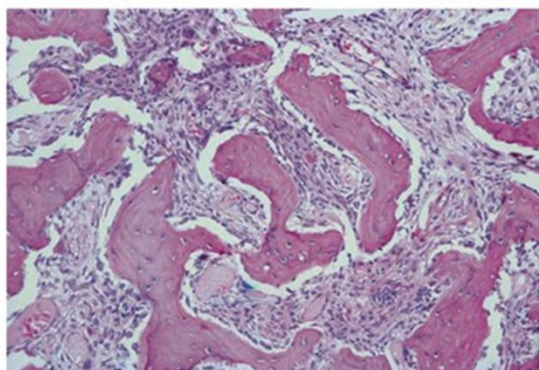
Younger patients  
Aggressive clinical course  
Cellular (benign) stroma  
Trabecular or spherical bone

##### Juvenile Psammomatoid Ossifying Fibroma

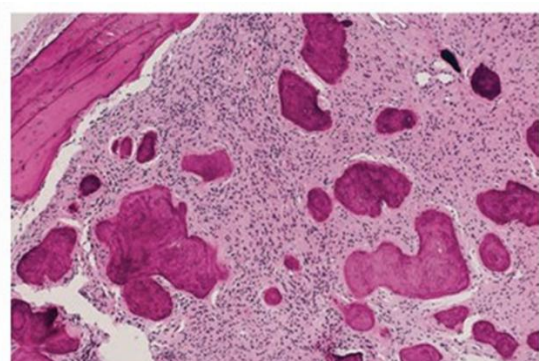
Biologically same as ossifying fibroma  
Spherical islands of bone (cementum)  
Bone and cementum microscopically identical

### Histopathology

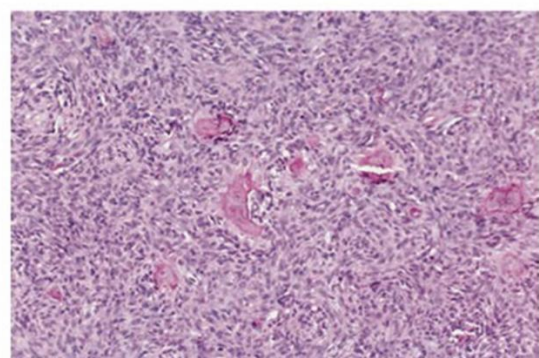
- ▶ Composed of fibrous connective tissue with well-differentiated spindled fibroblasts.
- ▶ Cellularity is uniform
- ▶ Collagen fibers are arranged haphazardly whorled, storiform pattern



• **Figure 12-6** Ossifying fibroma composed of bony trabeculae in benign fibroblast matrix.



• **Figure 12-4** Ossifying fibroma exhibiting islands of new bone in fibroblastic matrix. Note cortex at upper left.



• **Figure 12-5** Ossifying fibroma with cellular stroma and small bony islands.

### Differential Diagnosis

- ▶ Fibrous Dysplasia
- ▶ Well-circumscribed radiographic appearance of ossifying fibroma
- ▶ Osteblastoma
- ▶ Focal cemento-osseous dysplasia
- ▶ Focal osteomyelitis

### Treatment and Prognosis

- ▶ Surgical removal using curettage or enucleation
- ▶ Resection
- ▶ Recurrence: rare

## FIBROUS DYSPLASIA

- ▶ A condition in which normal medullary bone is replaced by an abnormal fibrous connective tissue proliferation in which new, nonmaturing bone is formed

### • BOX 12-5 Fibrous Dysplasia

#### Clinical Features

First and second decades (stabilizes at puberty and very slow growth thereafter)  
 Maxilla > mandible (one or more bones)  
 Ribs, femur, tibia also affected  
 Unilateral diffuse opacity  
 Asymptomatic; self-limiting  
 Serum laboratory values normal

#### Histopathology

New fibrillar bone trabeculae  
 Few osteoblasts; no osteoclasts  
 Homogeneous pattern  
 Vascular matrix  
 No inflammatory cells

#### Treatment

Surgical recontouring for cosmetics (after growth spurt)  
 Regrowth in 25% of treated cases

>, More frequently affected than.

### Etiology and Pathogenesis

- ▶ Represented a dysplastic growth resulting from deranged mesenchymal cell activity or a defect in the control of bone cell activity

### Clinical Features

- ▶ Presents as an asymptomatic, slow enlargement of involved bone
- ▶ May involve a single bone or several bones
- ▶ Monostotic fibrous dysplasia- used to describe the process in one bone.

- ▶ Polyostotic fibrous dysplasia- cases in which more than one bone is involved
- ▶ McCune- Albright syndrome
  - ▶ Polyostotic fibrous dysplasia
  - ▶ Cutaneous melanotic pigmentations (café-au-lait macules)
  - ▶ Endocrine abnormalities, specifically premature pubertal development
- ▶ Jaffe- Lichtenstein syndrome
  - ▶ Multiple bone lesions of fibrous dysplasia
  - ▶ Skin pigmentations
- ▶ Monostotic fibrous dysplasia > polyostotic form
- ▶ Maxilla > Mandible
- ▶ Maxillary lesions may extend to involve the maxillary sinus, zygoma, sphenoid bone, and floor of the orbit- Craniofacial Fibrous Dysplasia



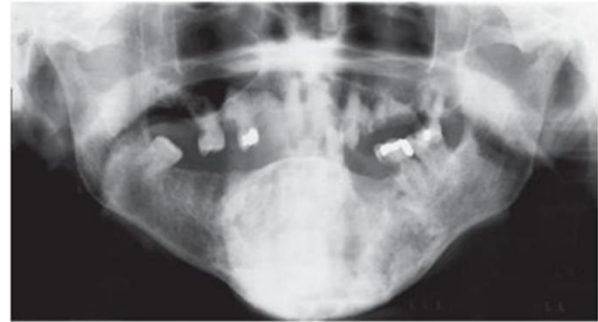
• Figure 12-7 A and B, Fibrous dysplasia of the right maxilla demonstrating asymmetric expansion.

### Radiographic Features

- ▶ Has a variable radiographic appearance
- ▶ Classic lesion: radiopaque change that imparts a “ground-glass” or “peau d’orange” effect
- ▶ In patients with long-standing disease: mottled radiolucent and radiopaque appearance
- ▶ Fingerprint bone pattern
- ▶ Superior displacement of the mandibular canal in mandibular lesions



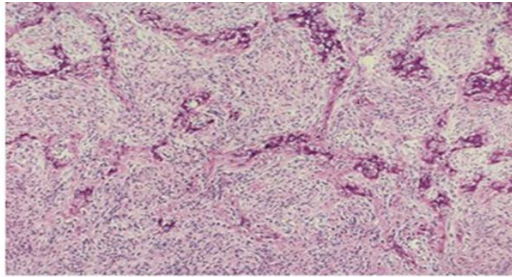
• Figure 12-9 Fibrous dysplasia of the right maxilla causing a characteristic diffuse ground-glass effect.



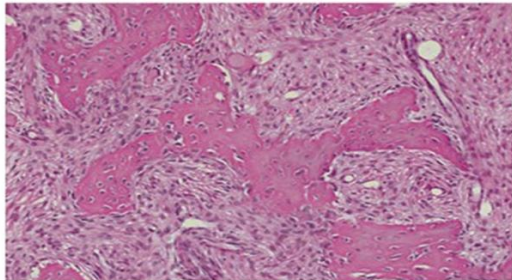
• Figure 12-10 Fibrous dysplasia of the mandible.

### Histopathology

- ▶ Consists of a slightly to moderately cellular fibrous connective tissue stroma that contains foci of irregularly shaped trabeculae of immature bone
- ▶ Constant ratio of fibrous tissue to bone
- ▶ Fibroblasts exhibit uniform spindle-shaped nuclei, and mitotic figures are not seen.
- ▶ The bony trabeculae assume irregular shapes likened to Chinese characters and they do not display any functional orientation.
- ▶ The bone is predominantly woven in type
- ▶ In a mature fibrous dysplasia lesion, lamellar bone may be found.



• **Figure 12-11** Fibrous dysplasia exhibiting fibroblastic matrix and uniform distribution of bony trabeculae (purple, not decalcified).



• **Figure 12-12** Fibrous dysplasia showing vascular fibroblastic matrix and irregular trabeculae of new bone.

### Differential Diagnosis

- ▶ Ossifying fibroma
- ▶ Chronic osteomyelitis

#### • BOX 12-6 Fibrous Dysplasia vs. Ossifying Fibroma

Fibrous Dysplasia	Ossifying Fibroma
First and second decades	Third and fourth decades
Maxilla > mandible	Mandible > maxilla
Diffuse opacity	Circumscribed
Self-limited	Continuous growth
One or more bones	One bone
Vascular matrix	Cellular fibrous matrix
Woven bone trabeculae	Bony islands and trabeculae
Stabilizes at puberty	Not hormone related
Recontour for cosmetics	Excise
Majority with mutations in GNAS gene	No genetic mutations identified

>, More frequently affected than.

### Treatment and Prognosis

- ▶ Biopsy
- ▶ Surgical recontouring
- ▶ Medical management: bisphosphonates and monoclonal antibodies to RANKL (denosumab)
- ▶ Malignant transformation

## CEMENTO-OSSEOUS DYSPLASIA

- ▶ A disease process of the jaws for which the precise cause is unknown
- ▶ Describes a spectrum of disorders that include periapical cemento-osseous dysplasia, focal cemento-osseous dysplasia, and florid cemento-osseous dysplasia

#### • BOX 12-1 Fibro-Osseous Lesions of the Jaws

Generic microscopic term  
Benign fibrous stroma with immature bone  
Includes reactive, dysplastic, neoplastic lesions  
Histologic overlap  
Diagnosis based on clinical pathologic correlation

#### • BOX 12-2 Fibro-Osseous Lesions of the Jaws: Entities Most Commonly Included

Ossifying fibroma  
Fibrous dysplasia  
Cemento-osseous dysplasia  
    Periapical/focal  
    Florid  
Chronic osteomyelitis

## OSTEOBLASTOMA/ OSTEOID OSTEOOMA

- ▶ Osteoblastoma- an uncommon primary lesion of bone that occasionally arises in the maxilla or the mandible
- ▶ Osteoid Osteoma- a smaller version of the same tumor
- ▶ Undetermined cause, although a genetic defect has been suggested

#### • BOX 12-7 Osteoblastoma

Large counterpart of osteoid osteoma  
Osteoblastoma >1.5 cm  
Osteoid osteoma <1.5 cm  
50% are painful  
Second decade is characteristic age  
Circumscribed  
Benign cellular (osteoblasts) neoplasm with new bone in scant fibrous stroma  
Treatment by excision; few recurrences

### Clinical Features

- ▶ Osteoblastoma= lesions larger than 1.5 cm in diameter
- ▶ Osteoid osteoma= lesions measuring 1.5 cm or less
- ▶ Posterior tooth-bearing regions of the maxilla and mandible
- ▶ Bony cortices may be expanded and tender to palpation
- ▶ Second decade
- ▶ Males > Females (2:1)
- ▶ Pain, often quite severe
- ▶ Localized swelling

### Radiographic Features

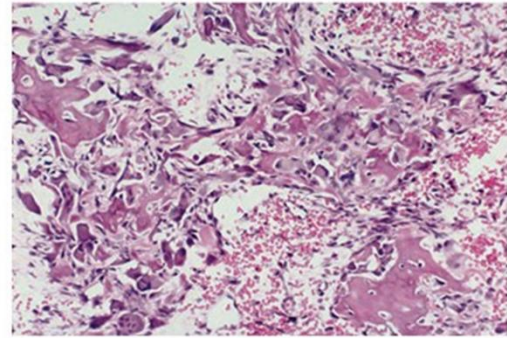
- ▶ Well circumscribed
- ▶ Lytic to mixed lucent-opaque pattern
- ▶ Thin radiolucency may be noted surrounding a variably calcified central tumor mass.
- ▶ Sclerosis of perilesional bone constant feature of osteoid osteoma
- ▶ Occasionally, a peripheral sun ray pattern of new bone production may mimic osteosarcoma.



• **Figure 12-13** Osteoblastoma of the right mandible.

### Histopathology

- ▶ Composed of irregular trabeculae of osteoid and immature bone within a stroma containing a prominent vascular network
- ▶ Several layers of plump, hyperchromatic osteoblasts typically line the bony trabeculae.
- ▶ Stromal cells are generally small and slender



• **Figure 12-14** Osteoblastoma showing abundant prominent osteoblasts adjacent to new bone.

### Differential Diagnosis

- ▶ Cementoblastoma
- ▶ Ossifying fibroma
- ▶ Fibrous dysplasia
- ▶ Osteosarcoma

### Treatment and Prognosis

- ▶ Conservative surgical approach (curettage or local excision)
- ▶ Tendency to invade tissues locally and to recur subsequently
- ▶ Malignant transformation

### OSTEOMA

- ▶ Benign tumors that consist of mature, compact, or cancellous bone.
- ▶ Periosteal Osteomas- osteomas that arise on the surface of bone
- ▶ Endosteal or Solitary Central Osteomas- those that develop centrally within bone

- ▶ Etiology: unknown, although trauma, infection, genetic/congenital, and developmental abnormalities have been suggested as contributing factors

### Clinical Features

- ▶ Second to fifth decades of life
- ▶ Males > Females
- ▶ Osteomas are usually solitary, except in patients with Gardner syndrome
- ▶ Periosteal osteomas- asymptomatic, slow-growing, bony, hard masses; asymmetry
- ▶ Endosteal osteomas- dense, well-circumscribed radiopacities
- ▶ Symptoms: headaches, recurrent sinusitis, and ophthalmologic complaints
- ▶ Gardner syndrome- an autosomal-dominant disorder characterized by intestinal polyposis, multiple osteomas, fibromas of the skin, epidermal and trichilemmal cysts, impacted permanent and supernumerary teeth, and odontomas
- ▶ Genetic defect is found in a small region on the long arm of chromosome 5 (5q21), where the familial adenomatous polyposis (APC) gene resides



• **Figure 12-15** Osteomas of Gardner's syndrome.

### Histopathology

Two distinct histologic variants of osteoma

- ▶ (1) relatively dense, compact bone with sparse marrow tissue

- ▶ (2) lamellar trabeculae of cancellous bone with abundant fibrofatty marrow; osteoblasts may be numerous, but osteoclasts are sparse.

### Differential Diagnosis

- ▶ Extoses- bony excrescences on the buccal aspect of alveolar bone
- ▶ Osteblastomas
- ▶ Osteoid osteomas
- ▶ Odontomas
- ▶ Cementoblastoma
- ▶ Condensing osteitis
- ▶ Osteoblastoma
- ▶ Focal sclerosing osteomyelitis

### Treatment and Prognosis

Surgical excision

- ▶ Periodic observation of small, asymptomatic osteomas
- ▶ Osteomas do not recur following surgical removal

## DESMOPLASTIC FIBROMA

- ▶ A benign, locally aggressive lesion of bone that can be considered the bony counterpart of fibromatosis at both gnathic and extragnathic locations
- ▶ Cause: unknown
- ▶ Exhibits locally aggressive clinical behavior

### • BOX 12-8 Desmoplastic Fibroma

Young adults (<30 years of age)  
 Bony counterpart of fibromatosis  
 Microscopic differential  
 Odontogenic fibroma  
 Odontogenic fibromyxoma  
 Low-grade fibrosarcoma  
 Follicular sac  
 Recurrence potential

## Clinical Features

- ▶ Younger than 30 years, with a mean age of 14 years
- ▶ No gender predilection
- ▶ Mandible- molar ramus region
- ▶ Lesions are slowly progressive and asymptomatic, eventually causing swelling of the jaw



## Radiographic Features

- ▶ May be unilocular or multilocular
- ▶ Radiographic margins may be well demarcated or poorly defined
- ▶ Cortical perforation and root resorption may be seen

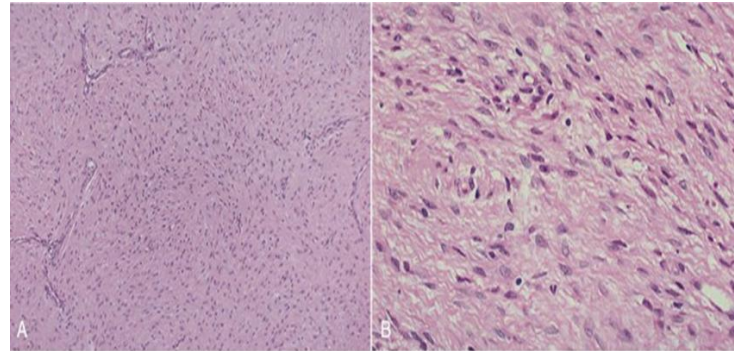


• **Figure 12-17** Desmoplastic fibroma in the right ramus of a 7-year-old boy.

## Histopathology

- ▶ Consists of interlacing bundles and whorled aggregates of densely collagenous tissue that contains uniform spindled and elongated fibroblasts

- ▶ Cytologic atypia and mitotic figures are not found



• **Figure 12-18 A and B**, Desmoplastic fibroma. Note evenly distributed and benign-appearing fibroblasts in collagenous stroma.

## Differential Diagnosis

- ▶ Odontogenic cysts
- ▶ Odontogenic tumors
- ▶ Non-odontogenic lesions
- ▶ Fibrosarcoma- greater cellularity, mitotic figures, and nuclear pleomorphism

## Treatment and Prognosis

- ▶ Treatment of Choice: Surgical resection
- ▶ Curettage- significant recurrence rate

## CHONDROMA

- ▶ A benign cartilaginous tumor of unknown cause
- ▶ Appears as a painless, slowly progressive swelling
- ▶ Mucosal ulceration
- ▶ Most lesions of the craniofacial complex arise in the nasal septum and ethmoid sinuses
- ▶ Maxilla= anterior region
- ▶ Mandible= body and symphysis; coronoid and condyle
- ▶ Male = Female
- ▶ Before 50 years of age

- ▶ Radiographic Appearance: irregular radiolucent area; foci of calcification
- ▶ Histopathology: consists of welldefined lobules of mature hyaline cartilage, chondrocytes are small and contain single, regular nuclei
- ▶ Treatment: Excision, rare recurrence

## CENTRAL GIANT CELL GRANULOMA

- ▶ A benign proliferation of fibroblasts and multinucleated giant cells within a well vascularized stroma that occurs almost exclusively within the jaws
- ▶ Presents as a solitary radiolucent lesion of the mandible or maxilla

### • BOX 12-9 Central Giant Cell Granuloma

#### Clinical Features

Most patients younger than 30 years of age; females affected more often than males  
 Radiolucency; mandible > maxilla; anterior jaw > posterior jaw  
 Recurrences unpredictable (10%-50%)

#### Histopathology

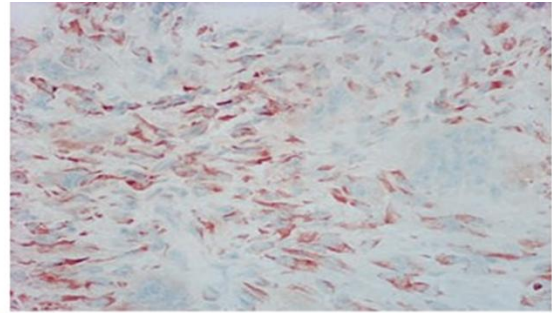
Benign fibroblast matrix (in cell cycle)  
 Giant cells variable (size, number, distribution)  
 Few to many mitotic figures  
 Cannot separate aggressive from nonaggressive lesions

#### Treatment

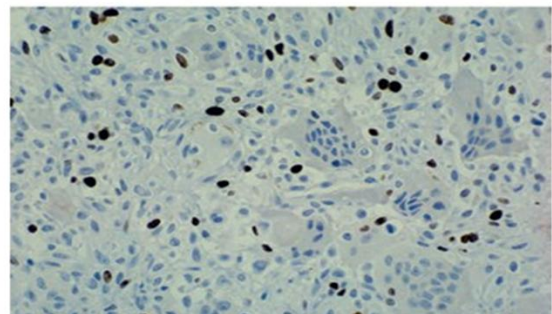
Traditional excision vs. medical management—calcitonin (osteoclast inhibition)  
 >, More frequently affected than.

### Etiology and Pathogenesis

- ▶ Represents a reparative response to intrabony hemorrhage and inflammation- reactive lesion
- ▶ Unpredictable and occasionally aggressive behavior, possible relationship to the giant cell tumor of long bones- benign neoplasm
- ▶ Primary tumor cells: fibroblasts



• **Figure 12-19** Central giant cell granuloma immunohistochemically stained for fibroblast-associated antigen. Note that stromal cells stain positive (red).



• **Figure 12-20** Central giant cell granuloma immunohistochemically stained for Ki-67 proliferation protein, showing that proliferating cells are located in the stromal component.

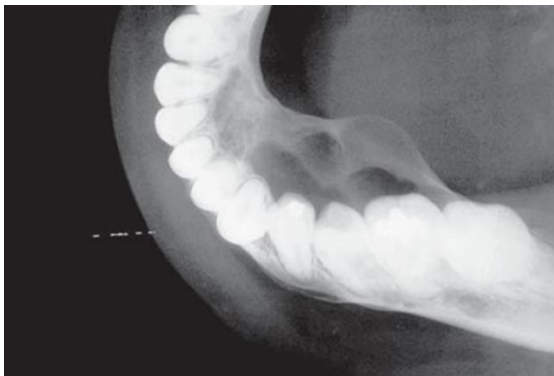
### Clinical Features

- ▶ Found predominantly in children and young adults- before 30
- ▶ Females > Males (2:1)
- ▶ Occurs almost exclusively in the maxilla and mandible
- ▶ Maxilla > Mandible; anterior to the permanent molar teeth, with occasional extension across the midline
- ▶ Painless expansion or swelling of the affected jaw; thinned cortical plates



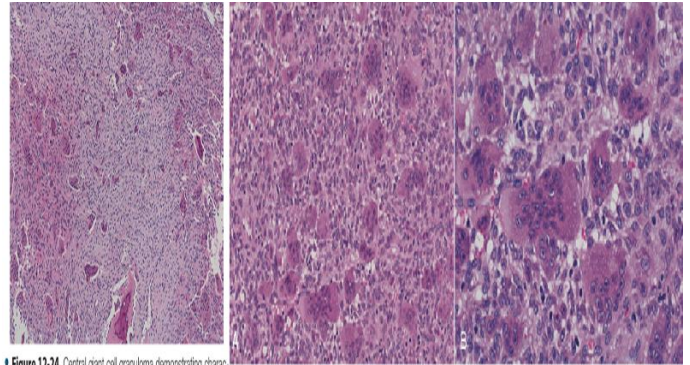
## Radiographic Features

- ▶ A noncorticated multilocular or, less commonly, unilocular radiolucency of bone
- ▶ Margins of the lesion are relatively well demarcated-scalloped border
- ▶ “Aggressive” CGCGs may cause pain or paresthesia. They exhibit rapid growth, root resorption, perforation of cortical bone, and a higher recurrence rate.



## Histopathology

- ▶ Composed of uniform fibroblasts in a stroma containing various amounts of collagen.
- ▶ Hemosiderinladen macrophages and extravasated erythrocytes are usually evident, although capillaries are small and inconspicuous.
- ▶ Multinucleated giant cells



• Figure 12-24 Central giant cell granuloma demonstrating characteristic patchy giant cell distribution in a fibroblastic matrix.

• Figure 12-25 A and B, Central giant cell granuloma. Note cellular matrix and evenly distributed giant cells.

## Differential Diagnosis

- ▶ Ameloblastoma
- ▶ Odontogenic myxoma
- ▶ Odontogenic keratocyst/Keratocystic odontogenic tumor
- ▶ Ameloblastic fibroma
- ▶ Ossifying fibroma
- ▶ Adenomatoid odontogenic tumor
- ▶ Hyperparathyroidism
- ▶ Aneurysmal bone cyst
- ▶ Cherubism

### • BOX 12-10 Central Giant Cell Granuloma: Microscopic Differential

#### Hyperparathyroidism

Elevated serum parathormone and alkaline phosphatase  
Multiple bone lesions; loss of lamina dura

#### Aneurysmal Bone Cyst

Blood-filled sinusoids present

#### Cherubism

Symmetric lesions  
Family history  
Perivascular collagen cuffing

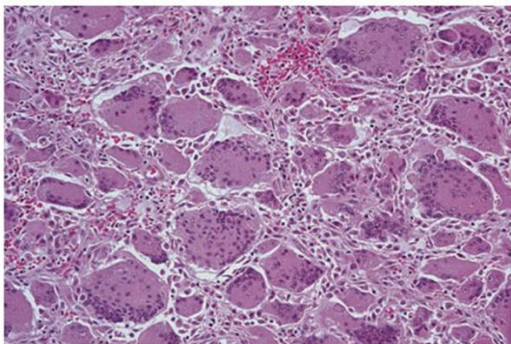
## Treatment and Prognosis

- ▶ Surgical management
- ▶ Excision or curettage of the tumor mass followed by removal of the peripheral bony margins

- ▶ Exogenous calcitonin administration
- ▶ Interferon-alpha
- ▶ Bisphosphonates
- ▶ RANK ligand antibodies (denosumab)

## GIANT CELL TUMOR

- ▶ True neoplasms that arise most commonly in long bones, especially in the area of the knee joint.
- ▶ Exhibit a wide spectrum of biological behavior from benign to malignant
- ▶ Third and fourth decades of life
- ▶ Slow growth and bone expansion, or they produce rapid growth, pain, or paresthesia
- ▶ Histopathology: presence of numerous multinucleated giant cells dispersed evenly among monocytemacrophages and spindle cells; Stromal cellularity



• **Figure 12-26** Giant cell tumor showing particularly large giant cells with abundant nuclei.

- ▶ Treatment: Surgical Excision

## HEMANGIOMA OF BONE

- ▶ Rare intraosseous vascular malformations that, when seen in the jaws, can mimic both odontogenic and nonodontogenic lesions.
- ▶ Difficult-to-control hemorrhage is a notable complication of surgical intervention.

## Clinical Features

- ▶ More than half of central hemangiomas of the jaws occur in the mandible, especially the posterior region.
- ▶ Occurs approximately twice as often in females as in males.
- ▶ Second decade of life
- ▶ Most common patient complaint: firm, slow-growing, asymmetric expansion of the mandible or maxilla
- ▶ Spontaneous gingival bleeding around teeth
- ▶ Paresthesia or pain, as well as vertical mobility of involved teeth
- ▶ Bruits or pulsation of large lesions
- ▶ Trophic effects of the hemangioma on adjacent hard and soft tissues are common.
- ▶ May be present with no signs or symptoms.

## Radiographic Features

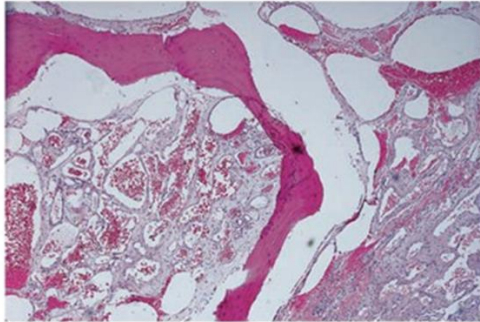
- ▶ Occur as multilocular radiolucencies that have a characteristic soap bubble appearance
- ▶ Rounded, radiolucent lesion in which bony trabeculae radiate from the center of the lesion, producing angular loculations.
- ▶ Less commonly, hemangiomas appear as cystlike radiolucencies.
- ▶ May produce resorption of the roots of teeth in the area.



• **Figure 12-27** Hemangioma of bone showing honeycomb radiographic pattern with associated root resorption.

## Histopathology

- ▶ Proliferation of blood vessels
- ▶ Most intrabony hemangiomas are of the cavernous type (large caliber vessels), while fewer are of the capillary type (small-caliber vessels).



• **Figure 12-28** Hemangioma of bone. Note numerous vascular channels surrounded by trabeculae of bone.

## Differential Diagnosis

- ▶ Ameloblastoma
- ▶ Odontogenic myxoma
- ▶ Odontogenic keratocyst
- ▶ CGCG
- ▶ Aneurysmal bone cyst

## Treatment and Prognosis

- ▶ May prove life threatening if improperly managed
- ▶ Extraction of teeth = fatal bleeding
- ▶ Needle aspiration
- ▶ Surgery, radiation therapy, sclerosing agents, cryotherapy, and presurgical embolization techniques

## LANGERHANS CELL DISEASE

- ▶ Formerly known as histiocytosis X and idiopathic histiocytosis
- ▶ A spectrum of disorders characterized by a proliferation of cells exhibiting phenotypic characteristics of Langerhans cells

- ▶ Cell of origin: Myeloid dendritic cell bearing markers shared with cutaneous Langerhans cells (CD1Aa and CD207)
- ▶ The term Histiocytosis X was used to encompass three disorders: eosinophilic granuloma, Hand-Schüller-Christian syndrome, and Letterer-Siwe disease
- ▶ Eosinophilic granuloma, or chronic localized LCD- refers to solitary or multiple bone lesions only.
- ▶ Hand-Schüller-Christian syndrome, or chronic disseminated LCD- a specific clinical triad of lytic bone lesions, exophthalmos, and diabetes insipidus.
- ▶ Letterer-Siwe disease, or acute disseminated LCD- a malignant process characterized by a rapidly progressive, often fatal course.

### • BOX 12-11 Langerhans Cell Disease: Classification

- Eosinophilic granuloma (chronic localized): solitary or multiple bone lesions
- Hand-Schüller-Christian (chronic disseminated): bone lesions, exophthalmos, diabetes insipidus
- Letterer-Siwe (acute disseminated): bone, skin, internal organs affected

## Etiology and Pathogenesis

### • BOX 12-12 Langerhans Cell Disease

- Proliferation of dendritic cells with Langerhans cell features
- Cells are CD1a+, CD207 and S-100+
- Cells contain Birbeck granules (ultrastructure)
- Few macrophages (histiocytes) are present
- Cause unknown
- Any age; three variants
- Radiograph shows punched-out noncorticated lesions or "floating teeth"
- Several treatment options
- Prognosis good to excellent; depends on form

## Clinical Features

- ▶ A condition of children and young adults
- ▶ Monostotic and polyostotic forms of the disorder may affect virtually any bone of the

body: skull, mandible, ribs, vertebrae, and long bones

- ▶ Oral changes: initial presentation in all forms of this disorder
- ▶ Tenderness, pain, swelling, and loosening of teeth
- ▶ The gingival tissues are often inflamed, hyperplastic, and ulcerated.
- ▶ Oral mucosal lesions: submucosal nodules, ulcers, and leukoplakia



• **Figure 12-29** Langerhans cell disease of the skull. (Reproduced with permission from Regezi JA, Sciubba JJ, Pogrel MA: Atlas of Oral and Maxillofacial Pathology. Philadelphia, 2000, WB Saunders, Figure 8-24.)

### Radiographic Features

- ▶ May exhibit solitary or multiple radiolucent lesions
- ▶ Bone lesions with a sharply circumscribed, punched-out appearance may occur in the central aspect of the mandible or maxilla.



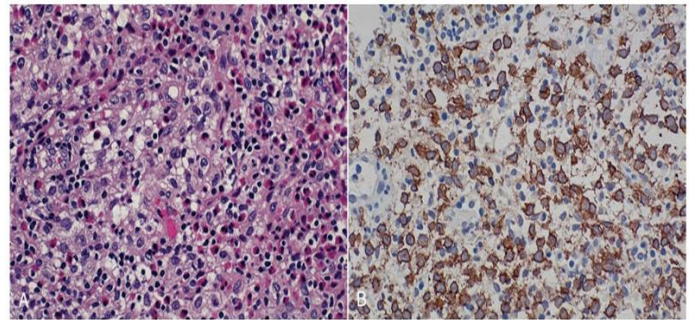
• **Figure 12-30** Langerhans cell disease. Note bilateral mandibular lesions.



• **Figure 12-31** Langerhans cell disease resulting in marked destruction of the mandible. (Courtesy Dr. Jerry R. Sorensen.)

### Histopathology

- ▶ Characterized by the proliferation of large cells with abundant cytoplasm, indistinct cell borders, and oval to reniform nuclei.
- ▶ Most often are arranged in sheets and may be admixed with various numbers of eosinophils and other inflammatory cells



• **Figure 12-32** Langerhans cell disease. **A**, Lesion is composed of pale Langerhans cells, eosinophils, and other chronic inflammatory cells. **B**, Immunohistochemical stain for Langerhans cell-specific CD1a antigen shows positive staining (brown) of tumor cells.

### Differential Diagnosis

- ▶ Juvenile or diabetic periodontitis
- ▶ Hypophosphatasia
- ▶ Leukemia
- ▶ Cyclic neutropenia
- ▶ Agranulocytosis
- ▶ Primary or metastatic malignant neoplasms
- ▶ Periapical cyst or granuloma
- ▶ Multiple myeloma
- ▶ Non-Langerhans histiocytoses
  - ▶ Rosai-Dorfman disease
  - ▶ Erdheim-Chester disease
  - ▶ Juvenile xanthogranuloma

### Treatment and Prognosis

- ▶ The younger the patient at the time of disease onset, the poorer the overall prognosis
- ▶ Chemotherapeutic agents
- ▶ Allogenic bone marrow transplantation

- ▶ Surgical curettage or low-dose radiation therapy.
- ▶ Cytotoxic agents

• **BOX 12-13** Langerhans Cell Disease: Treatment

**Localized Disease**

Curettage  
 Radiation, low dose  
 Intralesional corticosteroid injection  
 Rare spontaneous regression

**Disseminated Disease**

Immunosuppressive agents, corticosteroids, cytosine arabinoside

**TORI AND EXOSTOSES**

- ▶ Nodular protuberances of mature bone; their precise designation depends on the anatomic location.
- ▶ The mucosa surfacing these lesions occasionally may be traumatically ulcerated, producing a slow-healing, painful wound or, less commonly, osteomyelitis.
- ▶ Surgical removal for the purpose of prosthetic rehabilitation may be necessary.

*Etiology and Pathogenesis*

- ▶ May be an inherited condition
- ▶ Both genetic and environmental factors determine the development of mandibular tori.
- ▶ The palatal torus is relatively prevalent in: Asians, Native Americans, and the Inuit (Eskimos).
- ▶ Mandibular tori are seen more commonly in certain groups such as blacks and some Asian populations.
- ▶ Possible role of parafunctional habits in the origin of this condition

*Clinical Features*

- ▶ A sessile, nodular mass of bone that appears along the midline of the hard palate
- ▶ Occurs in females twice as often as it does in males in some populations
- ▶ Second or third decade of life
- ▶ Exhibits slow growth and is asymptomatic.
- ▶ Often present in a symmetric fashion along the midline of the hard palate.
- ▶ Evident on radiographs as diffuse radiopaque lesions



**TORUS PALATINUS**

- ▶ Bony exophytic growths that appear along the lingual aspect of the mandible superior to the mylohyoid ridge
- ▶ Almost always bilateral, occurring in the premolar region.
- ▶ Asymptomatic, exhibiting slow growth
- ▶ Second and third decades of life.
- ▶ May arise as solitary nodules or as multiple nodular masses that appear to coalesce.
- ▶ A significant gender predilection is not evident.



**TORUS MANDIBULARI**

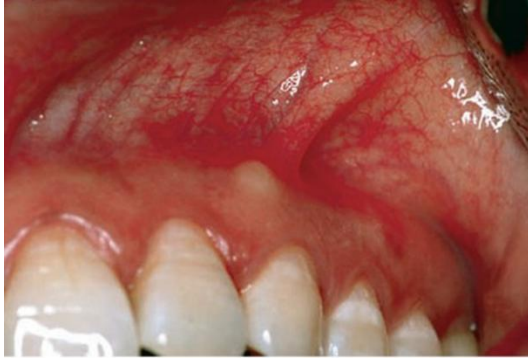
- ▶ Multiple (or single) bony excrescences that are less common compared with tori.
- ▶ Asymptomatic

- ▶ Present along the buccal aspect

of alveolar bone

- ▶ Most often in the posterior portions of both the maxilla and the mandible.

### EXOSTOSES



### *Histopathology*

- ▶ Composed of hyperplastic bone consisting of mature cortical and trabecular bone
- ▶ The outer surface exhibits a smooth, rounded contour

### *Treatment and Prognosis*

- ▶ Unnecessary unless it is required for prosthetic considerations or trauma to the overlying mucosa.
- ▶ Recurrence after surgical excision: rare

## CORONOID HYPERPLASIA

### *Etiology and Pathogenesis*

- ▶ Unknown
- ▶ History of trauma
- ▶ Coronoid enlargement
- ▶ Unilateral coronoid hyperplasia may be the result of a solitary osteochondroma; bilateral coronoid hyperplasia is apparently the result of a different process.
- ▶ X-linked inherited origin
- ▶ Increased activity of the temporalis muscle with unbalanced condylar support

### *Clinical Features*

- ▶ Often bilateral- results in limited mandibular movement
- ▶ Painless and, with a few exceptions, is not associated with facial swelling or asymmetry
- ▶ Young male patients
- ▶ Age of onset: around puberty

### *Radiographic Features*

- ▶ Enlarged and elongated coronoid processes
- ▶ Unilateral coronoid hyperplasia often results in misshapen or mushroom-shaped coronoid processes on radiographs.
- ▶ Temporomandibular joint radiographs are unremarkable.

### *Histopathology*

- ▶ Enlarged coronoid processes consist of mature, hyperplastic bone.
- ▶ The bone may be partially covered by cartilaginous and fibrous connective tissue.

### *Differential Diagnosis*

- ▶ Osseous and chondroid neoplasms

### *Treatment and Prognosis*

- ▶ Surgical excision
- ▶ Postoperative physiotherapy
- ▶ Recurrence: rare